N THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Application of	:	Date: May 9, 2011
CHU et al.	:	Docket: W9643-02
Serial No. 10/564,842	:	Art Unit: 1793
	:	Examiner: MICALI, Joseph

For: Abrasive Particles for Chemical Mechanical Polishing

PRELIMINARY AMENDMENT

VIA EFS WEB

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicant respectfully requests that the above-identified patent application be amended as follows:

Amendments to Claims begin on page 2 of this document.

Remarks begin on page 7 of this document.

Amendments to the claims:

The listing of claims set forth below replace all prior versions in the listings of claims in the subject application:

In the Claims:

Claim 1 (Currently Amended) An abrasive composition for polishing substrates comprising:

a plurality of colloidal silica abrasive particles comprising a polydisperse particle size distribution with a median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 15 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 20% by volume of the abrasive particles, and wherein the span value is measured by subtracting the d_{10} particle size of the colloidal silica particles from the d_{90} particle size of the colloidal silica particles.

Claim 2 (Previously Amended) An abrasive composition according to claim 1, wherein said abrasive particles comprise a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 15 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 15% by volume of the abrasive particles.

Claim 3 (Previously Amended) An abrasive composition according to claim 1, wherein said abrasive particles comprise a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 15 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 10% by volume of the abrasive particles.

Claim 4 (Previously Amended) An abrasive composition according to claim 1, wherein said abrasive particles comprise a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 15 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 20% by volume of the abrasive particles.

Claim 5 (Previously Amended) An abrasive composition according to claim 1, wherein said abrasive particles comprise a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 18 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 20% by volume of the abrasive particles.

Claim 6 (Previously Amended) An abrasive composition according to claim 1, wherein said abrasive particles comprise a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 20 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 20% by volume of the abrasive particles.

Claim 7 (Previously Amended) An abrasive composition according to claim 1, wherein said abrasive particles comprise a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 22 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 20% by volume of the abrasive particles.

Claim 8 (Canceled).

Claim 9 (Canceled).

Claim 10 (Canceled).

Claim 11 (Currently Amended) An abrasive slurry composition for polishing substrates comprising:

a plurality of colloidal silica abrasive particles comprising a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, and a span value, by volume, being greater than or equal to 15 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 20% by volume of the abrasive particles, and wherein the span value is measured by subtracting the d_{10} particle size of the colloidal silica particles from the d_{190} particle size of the colloidal silica particles; and

a solution having one or more chemical reactants.

Claim 12 (Previously Amended) An abrasive slurry according to claim 11, wherein said abrasive particles comprise a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 15 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 10% by volume of the abrasive particles.

Claim 13 (Previously Amended) An abrasive slurry according to claim 11, wherein said abrasive particles comprise a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 18 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 20% by volume of the abrasive particles.

Claim 14 (Previously Amended) An abrasive slurry according to claim 11, wherein said abrasive particles comprise a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 20 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 20% by volume of the abrasive particles.

Claim 15 (Canceled).

Claim 16 (Canceled).

Claim 17 (Currently Amended) A method for polishing substrates with an abrasive composition comprising:

providing a substrate to be polished;

and polishing the substrate using a plurality of colloidal silica abrasive particles comprising, a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 15 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 20% by volume of the abrasive particles, and wherein the span value is measured by subtracting the d_{10} particle size of the colloidal silica particles from the d_{90} particle size of the colloidal silica particles.

Claim 18 (Previously Amended) A method according to claim 17, wherein said abrasive particles comprise a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 15 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 10% by volume of the abrasive particles.

Claim 19 (Previously Amended) A method according to claim 17, wherein said abrasive particles comprise a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 18 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 20% by volume of the abrasive particles.

Claim 20 (Previously Amended) A method according to claim 17, wherein said abrasive particles comprise a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 20 nanometers, wherein a fraction of said particles greater than about 100

nanometers is from greater than about 0% to less than or equal to about 20% by volume of the abrasive particles.

Claim 21 (Canceled).

Claim 22 (Canceled).

Claim 23 (Previously Presented) An abrasive composition according to Claim 1, wherein the span value, by volume, is at least 25 nanometers.

Claim 24 (Previously Presented) An abrasive composition according to Claim, wherein the span value, by volume, is at least 30 nanometers.

Claim 25 (Currently Amended) An abrasive composition for polishing substrates comprising:

a plurality of abrasive particles consisting essentially of colloidal silica particles comprising a polydisperse particle size distribution with a median particle size, by volume, being about 20 nanometers to about 100 nanometers, a span value, by volume, being greater than or equal to about 15 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 20% by volume of the abrasive particles, and wherein the span value is measured by subtracting the d_{10} particle size of the colloidal silica particles from the d_{190} particle size of the colloidal silica particles.

Claim 26 (Currently Amended) An abrasive slurry composition for polishing substrates comprising:

a plurality of silica abrasive particles consisting essentially of colloidal silica particles comprising a polydisperse particle size distribution with median particle size, by volume, being about 20 nanometers to about 100 nanometers, and a span value, by volume, being greater than or equal to 15 nanometers, wherein a fraction of said particles greater than about 100 nanometers is from greater than about 0% to less than or equal to about 20% by volume of the abrasive particles, and wherein the span value is measured by subtracting the d_{10} particle size of the colloidal silica particles from the d_{190} particle size of the colloidal silica particles; and

a solution having one or more chemical reactants.

REMARKS

By the present Amendment, claims 1, 11, 17, 25 and 26 are amended. Claims 1-7, 11-14, 17-20, and 23-26 are pending herein.

Claims 1, 11 and 17 stand objected to. By the amendments to these claims, this objection is obviated, and Applicants respectfully request withdrawal of this objection.

Prior to examination of this application, Applicants respectfully request a telephonic interview with the Examiner.

Claims 1-7, 11-14, 17-20, and 23-26 stand rejected under 35 U.S.C. 103(a) over U.S. Patent No. 6,527,817 ("Fang et al.") in view of U.S. Patent Publication No. 2003/0198759 ("Fruge et al."). This rejection is respectfully traversed.

The Fang et al. documents describe polishing compositions that include a blend of fumed silica and colloidal silica. They do not disclose a span value for the abrasive. Moreover, Fang et al. only teaches a polishing dispersion with a particle size distribution defined by number. This will not necessarily result in the same particle size distribution defined by volume.

The definition of a particle size distribution by number can be significantly different than the definition of a particle size distribution by volume. For example, the particle distribution span by number may be significantly different than the particle distribution span value by volume since measurement by number does not take into account the volume of the particle. Thus, when defining particle size by number distribution or span value, if one very large particle is present, it will not significantly affect the distribution, whereas when defining a particle size distribution by volume, such a particle would significantly affect the distribution.

In addition, Fang et al. measure the properties of a blend of fumed silica and colloidal silica particles. Fang et al. does not disclose the properties of the colloidal silica. Thus, any description in Fang et al. about the particle size distribution of abrasive particles, including reference to sigma g, relates to the blend and not the colloidal silica particles.

Fruge et al. describes a colloidal silica that is used for digital media applications, such as ink jet recording sheets (see paragraph ([0001]). The colloidal silica is used to impart gloss to the sheets and to provide good ink adsorption. There is no mention in Fruge et al. that the colloidal particles described therein would be suitable for use in chemical mechanical planarization ("CMP") formulations.

The examiner bears the burden of establishing a *prima facie* case of obviousness, *In re Deuel*, 51 F.3d 1552, 34 USPQ2d 1210 (Fed. Cir. 1995), *In re Rijckaert, 9*: F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993); *In re Oetiker,* 977 F.2d 1443, 1445, 24 USPQ 2d 1443, 1444 (Fed. Cir. 1992). Only if this burden is met does the burden of coming forward with rebuttal argument or evidence shift to the applicant. *Rijckaert,* 9 F.3d at 1532, 28 USPQ2d at 1956. When the references cited by the examiner fail to establish a *prima facie* case of obviousness, the rejection is improper and will be overturned. *In re Fine,* 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988).

The combination of elements in a manner that reconstructs the applicant's invention only with the benefit of hindsight is insufficient to present a *prima facie* case of obviousness. There must be some reason, suggestion, or motivation found in the prior art whereby a person of ordinary skill in the field of the invention would make the combination. That knowledge can not come from the applicant's invention itself. *Diversitech Corp v. Century Steps, Inc.,* 850 F.2d 675. 678-79, 7 USPQ2d 1315, 1318 (Fed. Cir. 1988); *In re Geiger,* 815 F.2d 686, 687, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987); *Interconnect Planning Corp. v. Feil,* 774 F.2d 1132, 1147, 227 USPQ 543,551 (Fed. Cir. 1985).

In instant case, Applicants submit that one of ordinary skill in the art would not have combined the colloidal silica described in Fruge et al. with the fumed silica described in Fang et al., since colloidal silica that provides acceptable gloss and ink adsorption in ink jet applications may not provide the desired abrasiveness that is suitable for CMP formulations. There would have been no motivation for the artisan to make such a combination.

Moreover, even if the artisan were to combine the teachings of Fruge et al. with the teachings of Fang et al., one would still not arrive at the present invention (i.e., the span value). Applicants submit the span value is a desirable feature that provides improved planarization in the formulation (see the Examples of the present application where small abrasive span values in CMP formulations provides inferior results).

Fang et al. describe a particle size distribution of a blend of fumed silica particles and colloidal silica particles. Fruge et al. does not rectify this teaching of Fang et al. since the artisan would still use a blend of particles that would not have the instant claimed particle size

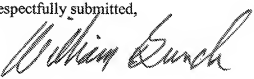
distribution. There is simply no teaching in Fang et al. (or Fruge et al.), or motivation for the artisan, to prepare a CMP formulation with colloidal silica having a particle size distribution and span value as recited in the present claims. Moreover, due to the significant differences in the manufacture of colloidal and fumed silicas, the particle size distributions may vary considerably. Thus, it is unclear from Fang et al. as to the nature of the colloidal silica particle size distribution.

Therefore, Applicants submit that no *prima facie* case of obviousness has been set forth in the Office Action.

Accordingly, it is submitted that the subject matter of claims 1-7, 11-14 17-20 and 23-26 are not rendered obvious by the above-mentioned references. Applicants respectfully request withdrawal of this rejection.

In view of the above remarks, Applicants earnestly solicit the withdrawal of the rejections set forth in the December 8, 2010, Office Action and notification to that effect in the form of a Notice of Allowability.

Respectfully submitted,



William D. Bunch
Attorney for Applicant
Reg. No. 35,027

Dated this 9th day of May 2011.

W. R. Grace & Co.-Conn.
7500 Grace Drive
Columbia, Maryland 21044
(410) 531-4333